

Linac to BLIP Caps

D. Beavis

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Goal

- Review Caps with Raster upgrade
- Plan for future upgrades
- NEPA commitment to extend BLIP-Y cap to 10 feet past the tunnel wall

Conclusions

- BLIP-Y Cap will need to extend to 15 feet past the tunnel wall.
- BLIP-Y and BLIP Cap will need to cover the HEBT tunnel till the BLIP spur wall is about >15 feet away from the HEBT wall.
- Blip cap has a notch that needs to be covered.
- Upstream source needs to be understood

BLR CAP PLAN VIEW

Linac to BLIP Beam

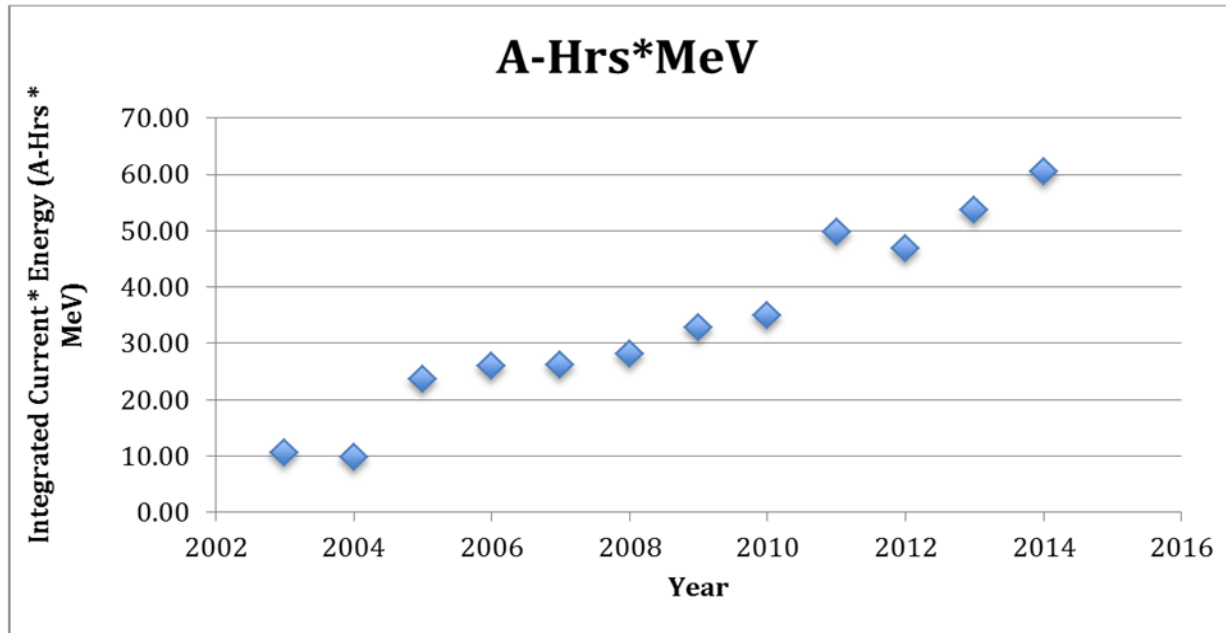
Table I: Yearly Beam and Losses to BLIP

Parameters	2015	2016 Phase I (Raster)	Future Phase II
Average Current	115 <u>uA</u>	140 <u>uA</u>	240 <u>uA</u>
Number of day @ 117 MeV	210	200	~130
Number of day @ 200 MeV	20	30	~100
Losses @750 <u>keV</u>	20%	20%	20%
Losses in <u>linac</u>	0.01%	0.01%	0.01%
Losses in transfer line	0.01%	0.01%	0.01%
Losses at Collimator	0.1 %	0.1%	0.1%

Use 230 days at 240 micro-amps at 200 MeV

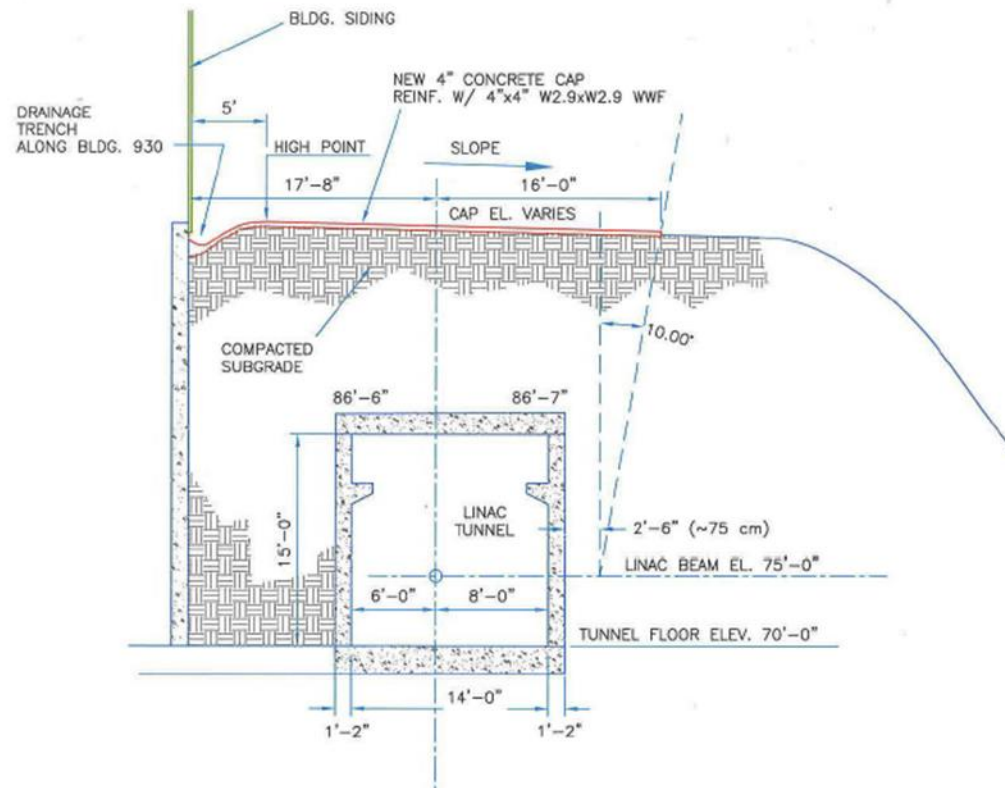
More than a factor of 2 conservative

Operating History



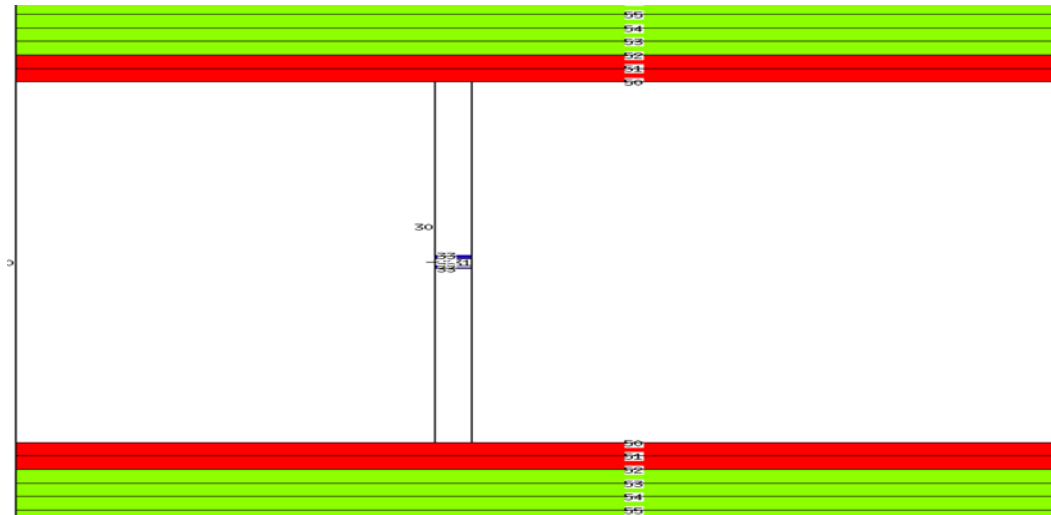
During 2003 review—not expected to have increases in operating beam power
See we are a factor of six higher at present

BLIP-Y Cap



Tunnel slope shown wrong—slopes to outside. Same is true for the HEBT tunnel roof.

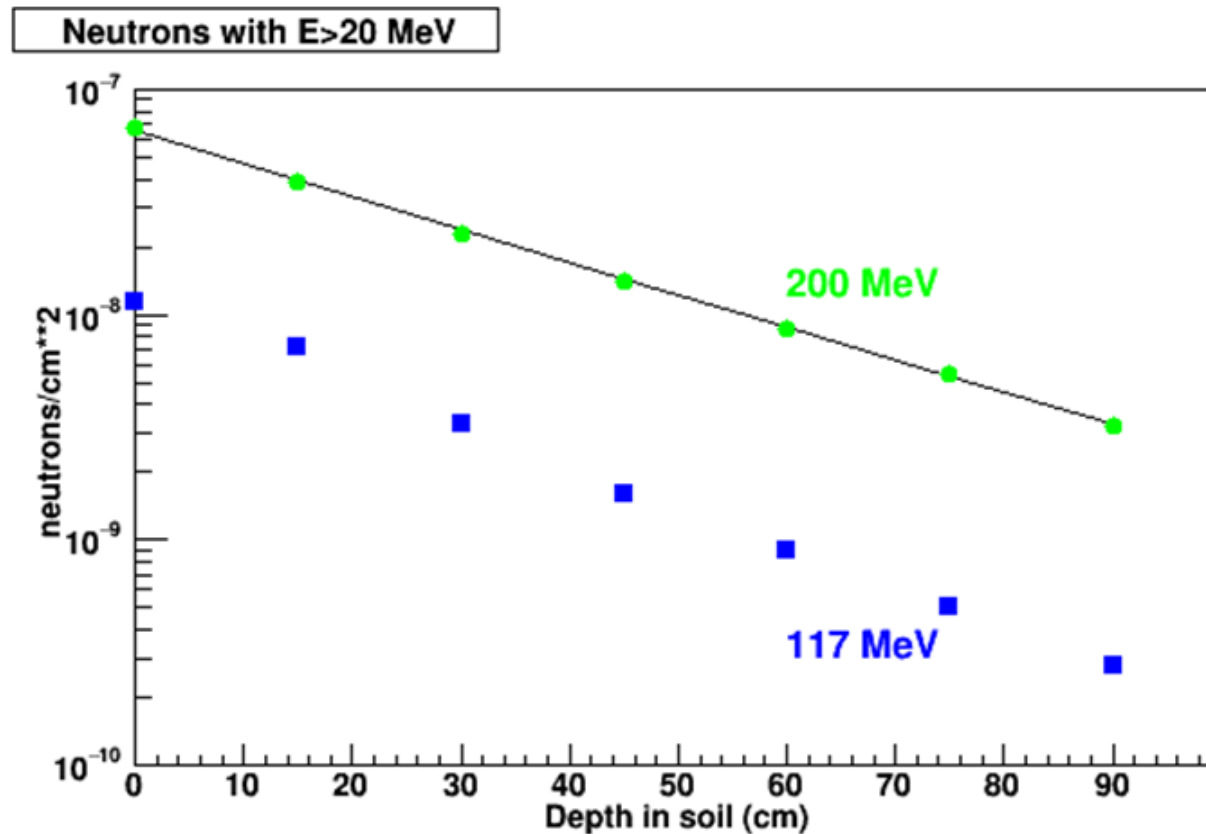
Simple Collimator model



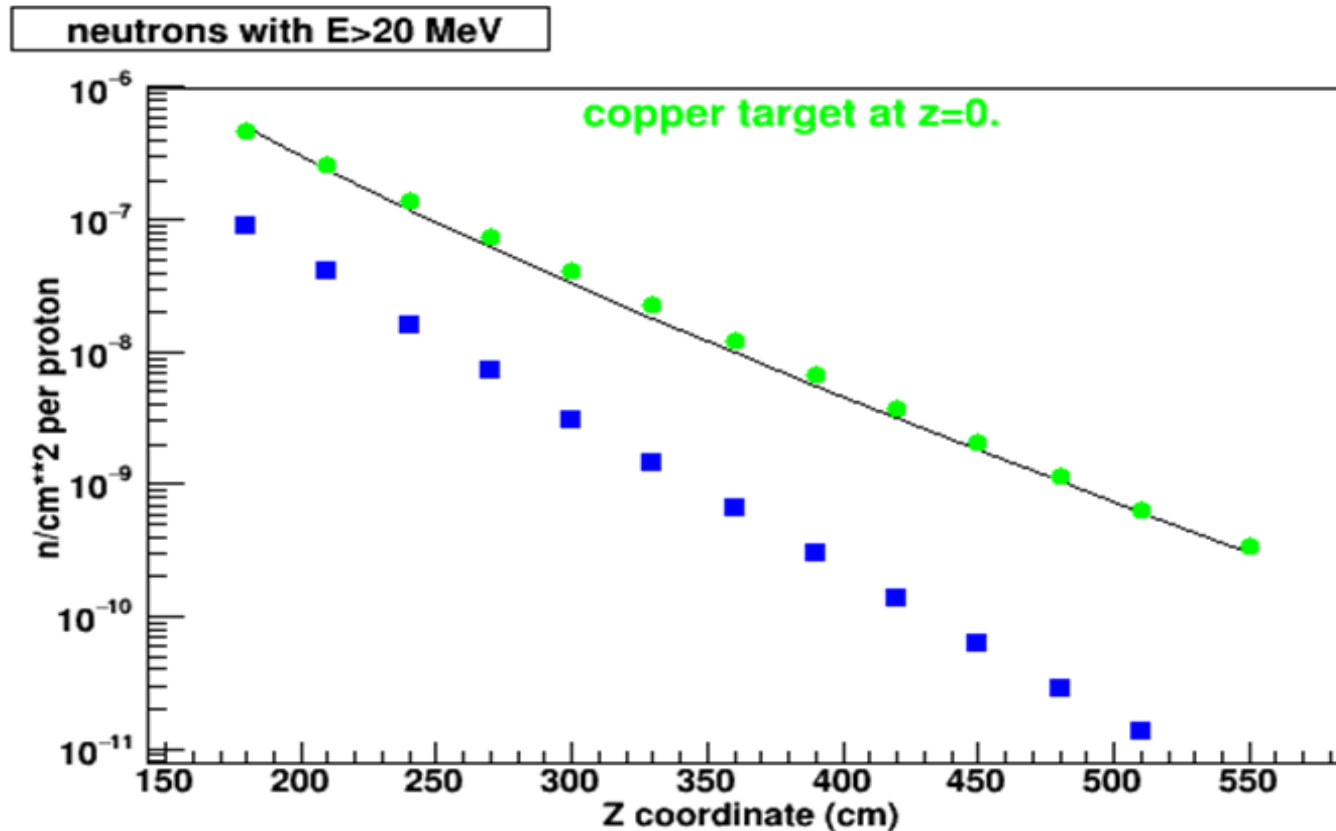
- Carbon target
- No side shielding-30 cm concrete wall then soil
- 200 MeV
- Transverse analysis– Attenuation length 38 cm

Neutrons/cm**2 E>20 MeV

Use exponential to extrapolate
fluence



Blip Target



Forward radiation– Attenuation length 71 cm
Cap must extend to 1140 cm d/s of target (37 ft)

BNL action Limit

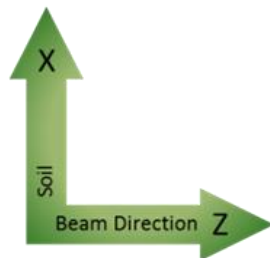
- For Tritium 5% of the DWS
 - Goal is 1000 pCi/l
- Rainwater leaches out a column of soil
- The height of the column depends on geometry including distance
 - Transverse geometry height is 440 cm
 - Forward height is 800 cm

Cap changes

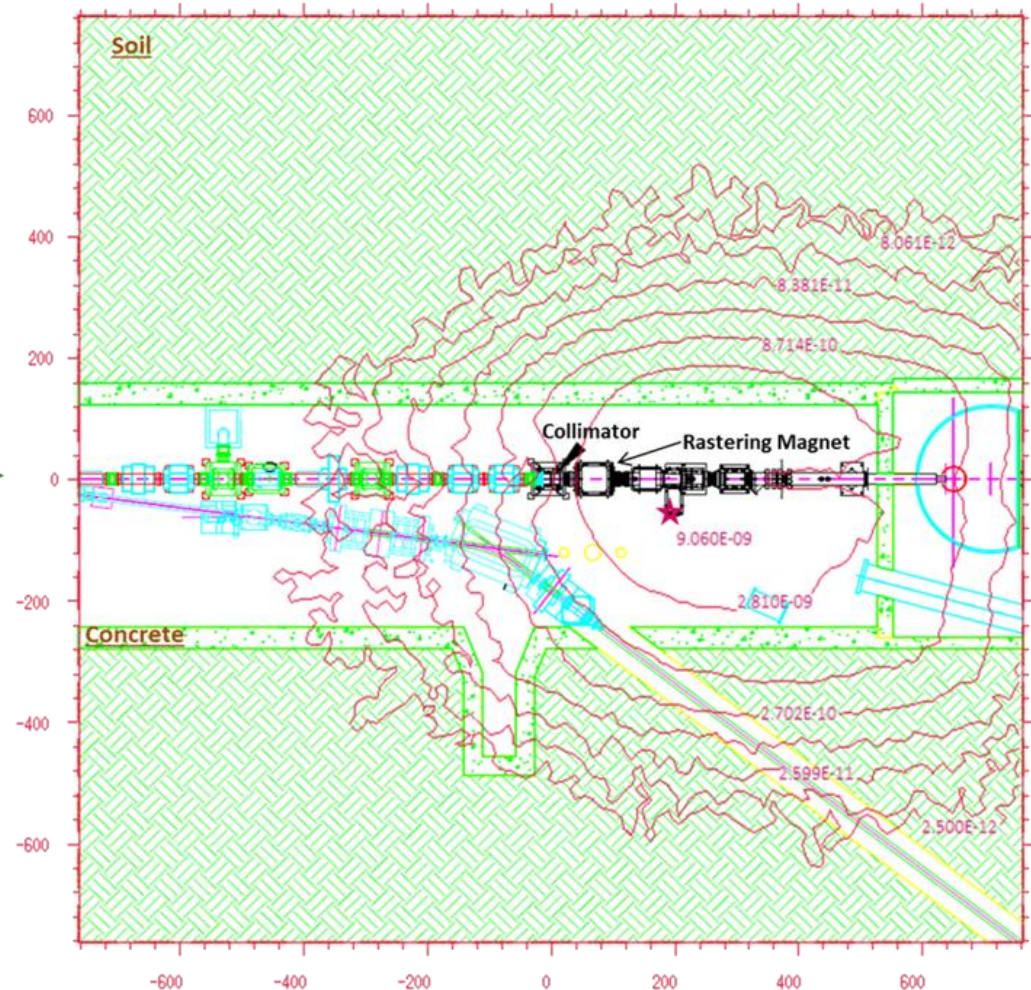
- BLIP-Y --15 feet past tunnel wall.
 - Includes 10 degree angle to surface
 - Can be adjusted for tunnel asymmetry
- Downstream area of pump room must be capped.
Water flows on HEBT roof to under the caps.
- The notch is too close in the downstream BLIP cap
- **Laser Profile Monitor induced Loss**
 - Upstream of BLIP bending magnet
 - Does it impact upstream edge of Cap?

Calculation by Seemungal and Yip

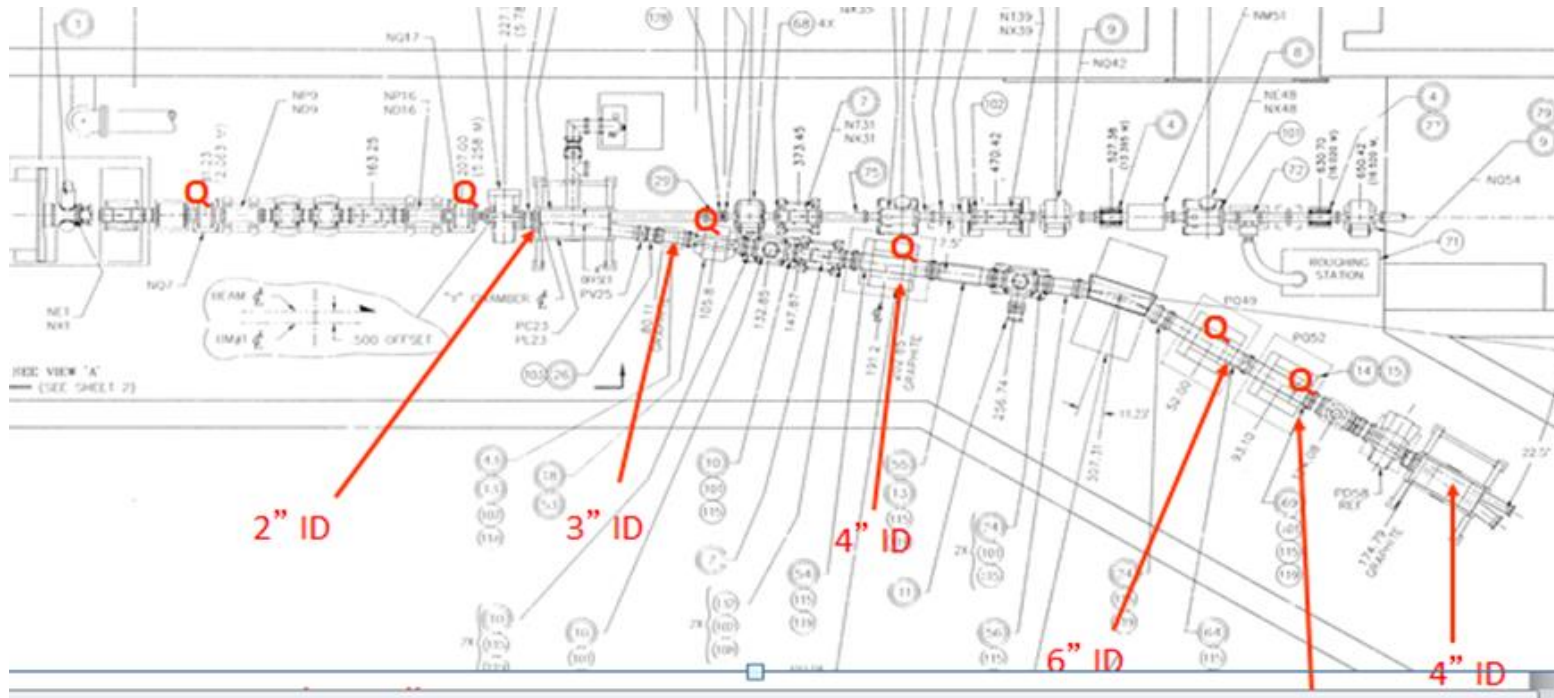
BLIP Rastering
Magnet
Neutron Flux
($n \cdot \text{cm}^{-2}$ per incident proton)



HEBT side 340 cm
REF side 280 cm
Mine 310 cm
Then add 130 cm for 10
degrees

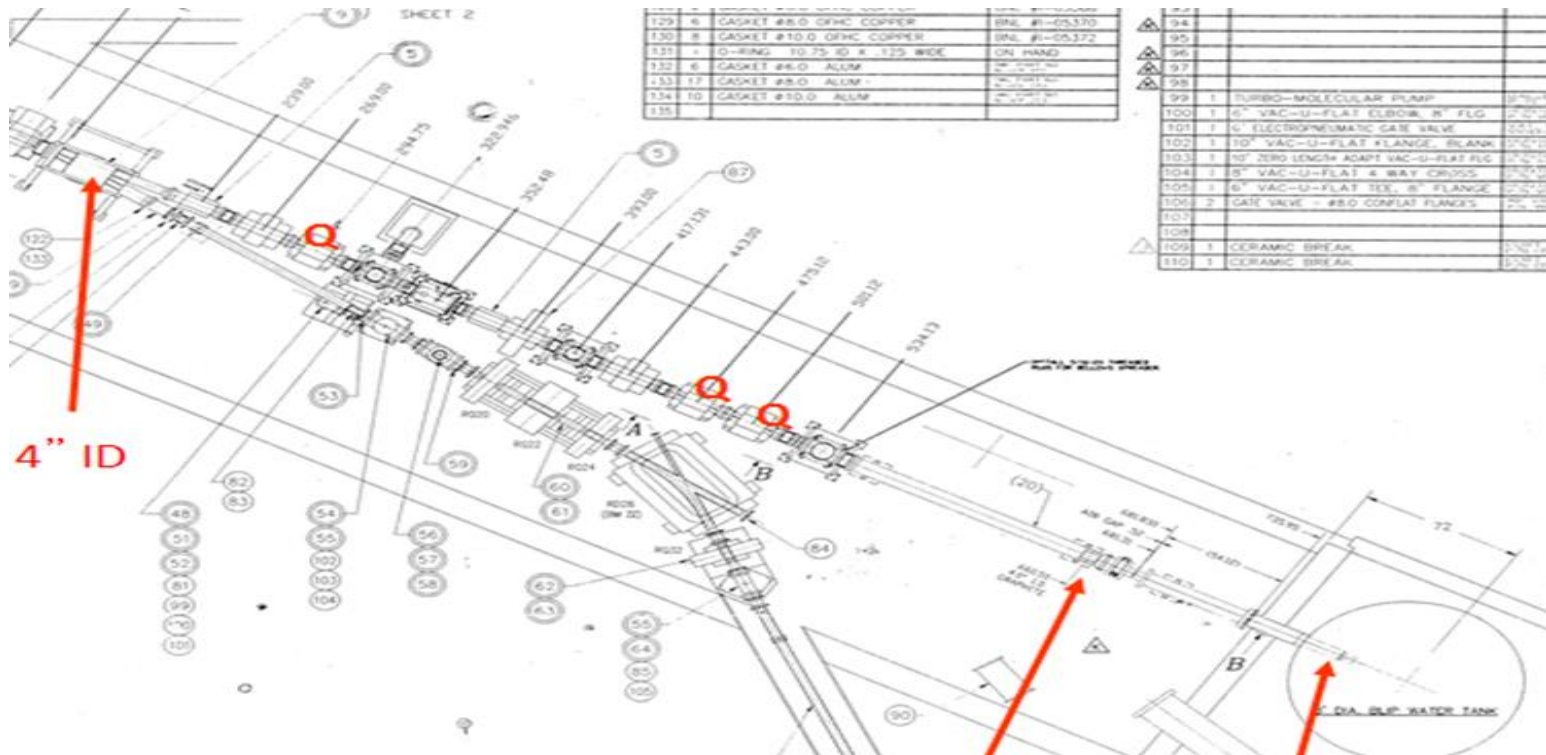


BLIP transport



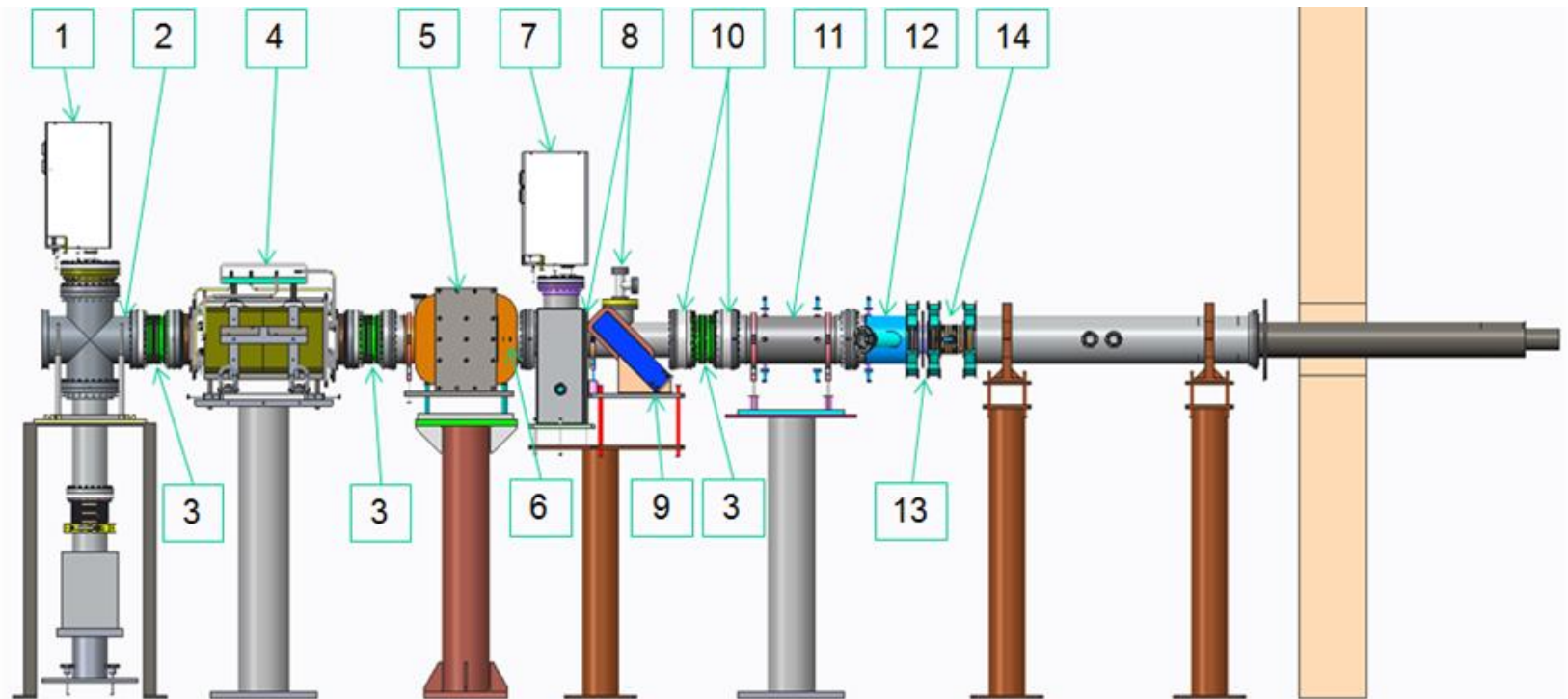
Graphite collimators

BLIP Transport



Raster components in d/s end
HEBT tunnel adjacent

Raster

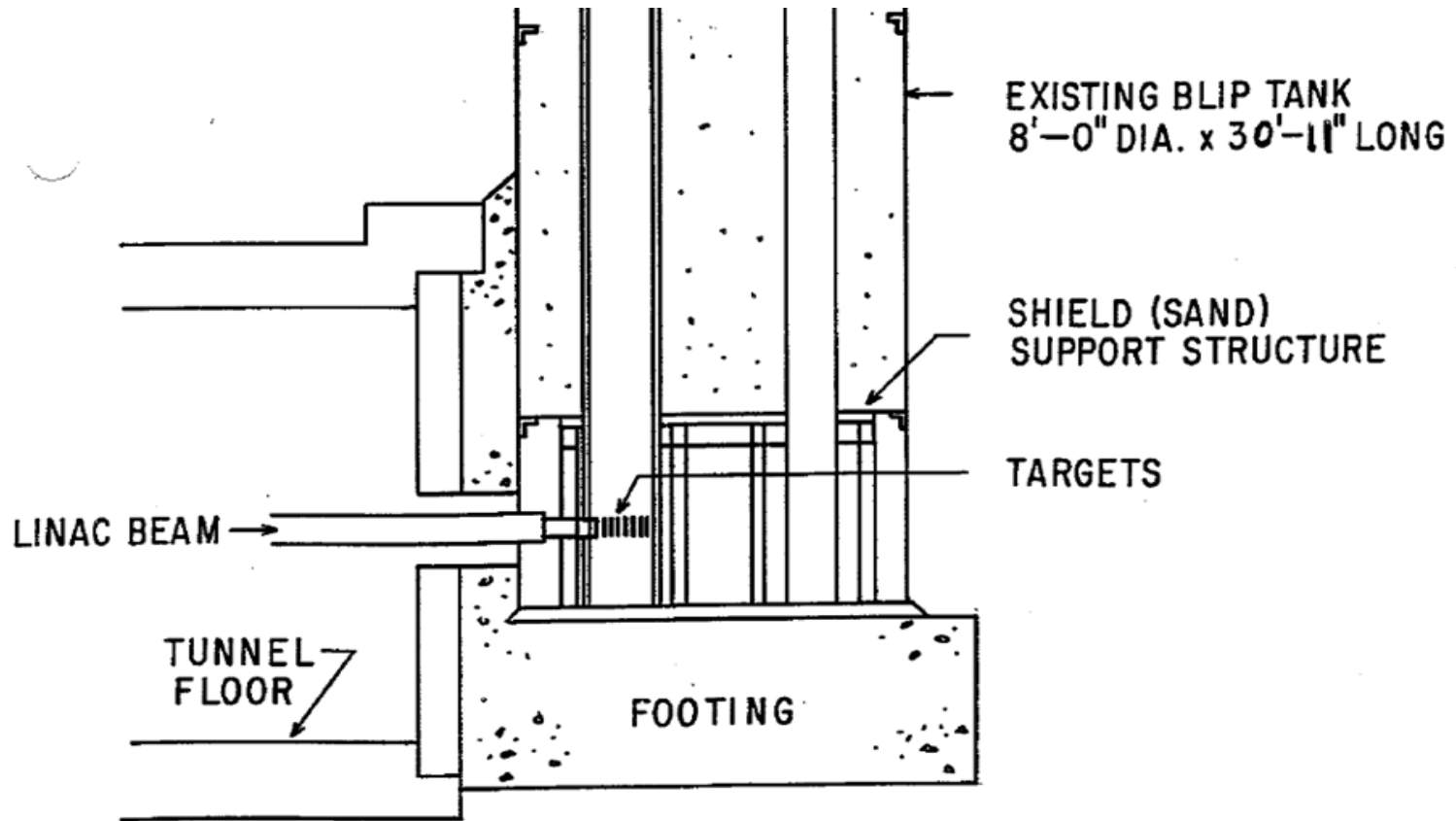


1. plunging harp
2. 6.50" collimator (internal)
3. aluminum bellows (3x)
4. raster magnet
5. steering magnet (existing)

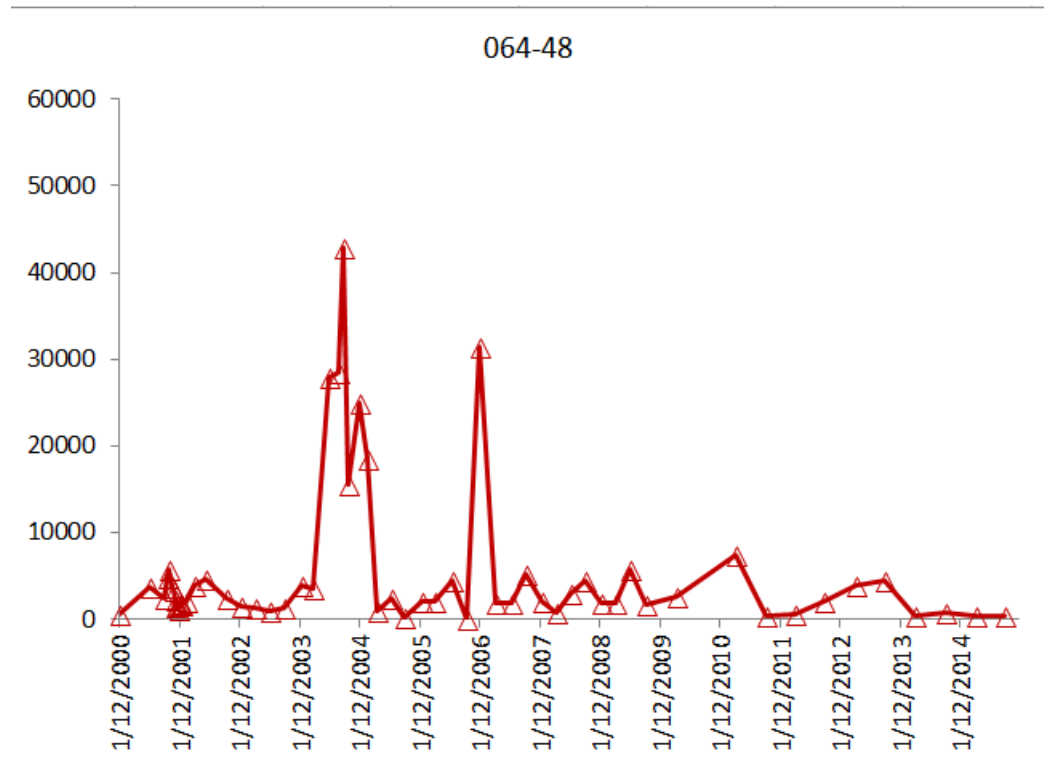
6. 4.25" collimator (internal)
7. plunging harp
8. laser profile monitor
9. laser profile monitor magnet
10. beam current transformers (2x)

11. beam position monitor
12. viewport spool
13. beryllium window (existing)
14. aluminum bellows (existing)

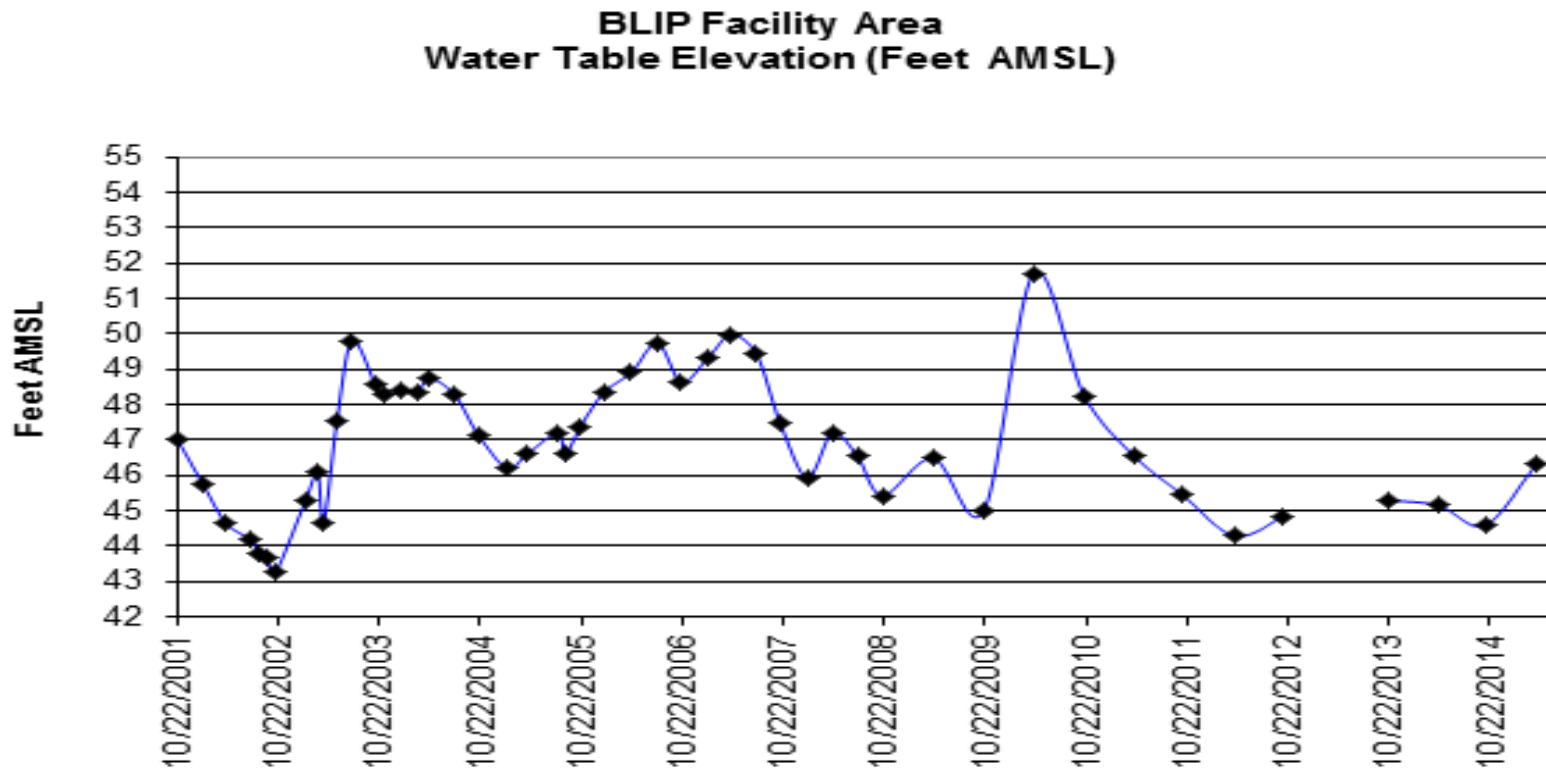
Blip Target Station



Well Data



Groundwater elevation



The well in 4/15 was 2690 pCi/l rather than less than 1000
Large losses occurred in FY14 due to vacuum leak

summary

- Have design numbers for caps
- One open question on upstream edge
- Well data suggests that there may be a weakness to present system including loss monitors that are not sensitive enough
- Loss monitor upgrade will be in place next year.
- Present caps have been doing a good job